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THE INDIAN SOCIETY FOR HYDRAULICS

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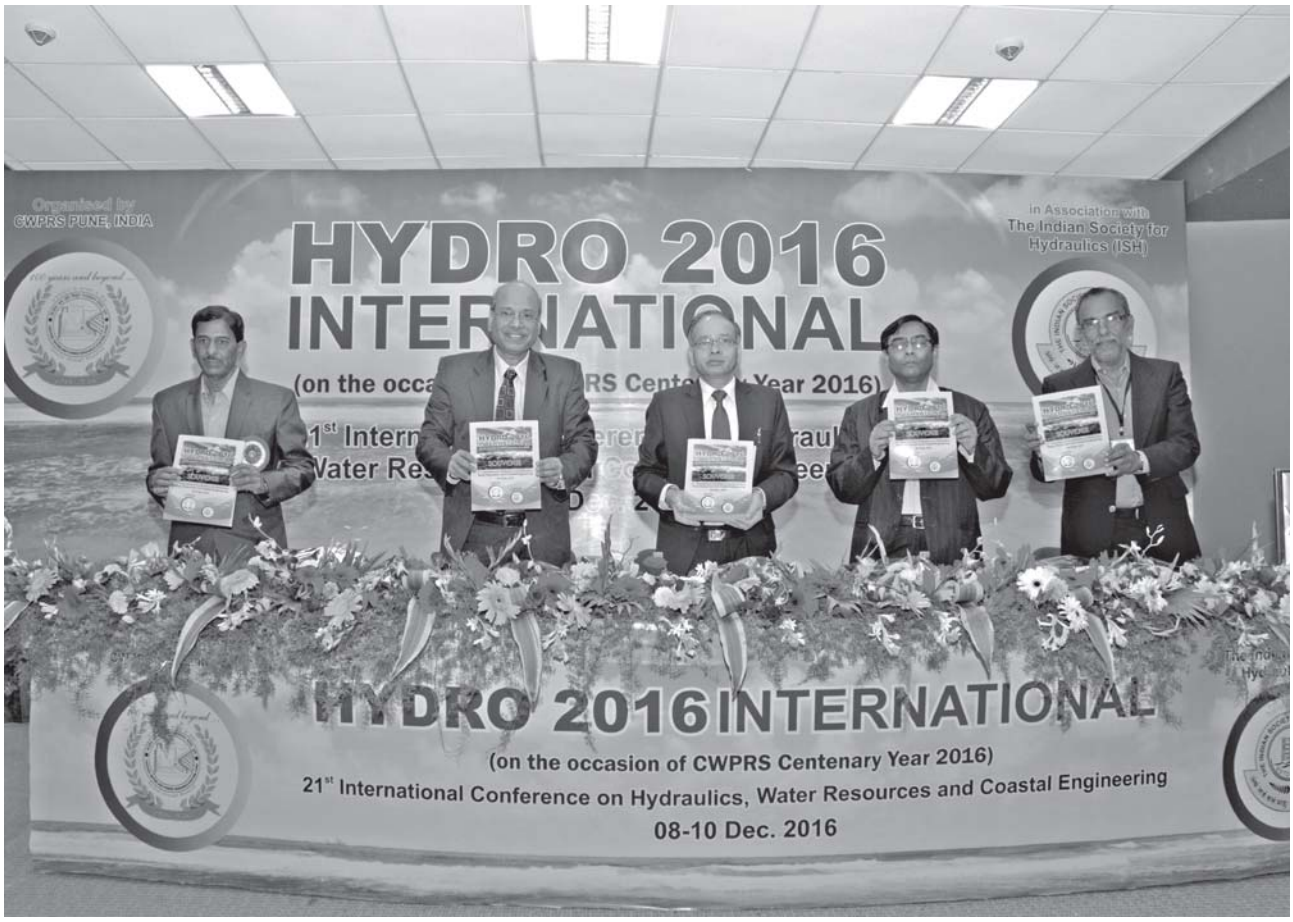
HYDRO-2016 International

"Hydro-2016 International: Conference on Hydraulics, Water Recourses and Coastal Engineering" was held during December 8 - 10, 2016 at Central Water & Power Research Staion (CWPRS) Pune. It represented a link in the chain of such "Hydro" conferences held annually at different places in India since 1995 under the aegis of Indian Society for Hydraulics. This was the 21st HYDRO conference and the major theme was "Hydraulics, Water Resources and Coastal Engineering". The various themes of the conference were Hydraulics, River engineering and fluvial hydraulics, Surface hydrology and Watershed Management, Groundwater Hydrology, Water Resources, Coastal Engineering, and Hydro-informatics. Around 350 delegates representing academic institutions, research labs, consulting engineers and administrative bodies attended the conference. Four hundred and forty five research papers were received out of which 273 were finally accepted and about 216 papers were presented in four parallel sessions totalling 38 sessions. Additionally eight experienced researchers from academic institutions and research labs around the world gave invited talks on state of the art works carried out by them in the water sector. The S N Gupta memorial lecture was delivered by Prof.Nayan Sharma, IIT, Roorkee, on the topic "Some critical research areas in water resources Management". Dr.M.Baba, Former Director, CESS Trivandrum was honoured with "ISH Lifetime Achievement Award" while "R J Garde Research Award" was conferred on Shri.M.M.Vaidya, CWPRS, Pune. The details of other regular awards are given below:

Lighting of lamp during inaugural ceremony



Release of souvenir during inaugural ceremony

Inaugural address by ISH President Dr. M.K. Sinha

ISH GB Meeting on 8th Dec 2017 at CWPRS, Pune

ISH Awards Ceremony during HYDRO 2016

ISH LTA Award to Dr.M.Baba, during HYDRO 2016

INDIAN SOCIETY FOR HYDRAULICS

ISH LIFE – TIME ACHIEVEMENT AWARD 2016

Dr. Mytheenkhan Baba

Dr. Mytheenkhan Baba, former Director of the Centre for Earth Science Studies (CESS), has over 44 years of outstanding professional service in the fields of alternate coastal protection, ocean waves, coastal processes, coastal zone management, coastal resource planning and hazard assessment, which include establishment of a Centre for Advanced Training in Earth System Sciences and Climate in IITM, Pune during 2010-12.

Dr. Baba was the Chairman and Expert Member of several national and international committees. He is presently holding the post of the Chairman of a Task Force of coastal experts constituted by the Government of Gujarat for preparation of a master plan for the protection of Gujarat coast. He is also associated with the World Bank and Asian Development Bank (ADB) program on 'Climate Resilient Coastal Protection and Management Project in India' as Deputy Team Leader.

Dr Baba was instrumental in initiating studies on the temporal and spatial distribution characteristics of wave parameters, wave grouping, wave power, etc. He had a pursuit for linking the offshore coastal oceanography with beach sedimentation processes. Championing alternate methods of coastal protection and integrated coastal zone management, he contributed immensely towards restructuring of coastal regulation as an effective tool for coastal management. He has published over 100 research papers / reports and co-edited four books and a Wave Atlas.

In recognition of his outstanding contribution in the field of hydraulic research, the Indian Society for Hydraulics feels extremely privileged to present Dr. Mytheenkhan Baba its Life – Time Achievement Award for the year 2016.

Awarded on 08.12.2016

Dr M K Sinha
President
Indian Society for Hydraulics

Minutes of Twenty First General Body Meeting

The 21st Annual General Body meeting of The Indian Society for Hydraulics (ISH) was held on 8th December 2016 at 1730 hrs at CWPRS, Pune, during HYDRO-2014 International conference. About 55 members attended the meeting. The meeting started with a welcome address by Dr.M.K.Sinha, President, ISH. The minutes of the 20th General Body meeting held on 17th December 2015 at IIT Roorkee was confirmed. It was informed that 9 ISH members obtained IAHR membership through ISH for the year 2016 as per the agreement of ISH-IAHR. Secretary, Treasurer and Editor presented their reports in the meeting.

The proposal from Dr. N.P. Singh, LDCE, Ahmedabad was put up before the General Body for hosting **HYDRO-2017**. After discussions, it was approved to hold **HYDRO-2017** at LDCE, Ahmedabad as per the terms and conditions laid by ISH. The audited accounts of the society for the year 2015-16 was circulated and approved by the General Body. The meeting concluded with vote of thanks to the Chair.

ACHIEVEMENTS

Dr. Mukesh Kumar Sinha
ISH President has been appointed as Executive Member, NCA, Indore.

&

Dr. (Mrs) V.V. Bhosekar
ISH Vice President has assumed the charge of Director, CWPRS from June 2017.

The Indian Society for Hydraulics wishes the very best for their future endeavours.

INDIAN SOCIETY FOR HYDRAULICS AWARDS (HYDRO – 2016)

ISH Lifetime Achievement Award

Dr. M. Baba
Former Director, CESS Trivandrum
• dr.mbaba@gmail.com

S. N. Gupta Memorial Lecture

Prof. **Nayan Sharma**, IIT, Roorkee
Lecture Topic: "Some critical research areas in water resources Management"
• nayanfwt@iitr.ac.in

Prof. R. J. Garde Research Award

Shri. M. M. Vaidya, CWPRS, Pune
• vaidya_mm@cwprs.gov.in

G. M. Nawathe Puraskar

(Best Paper Presented in HYDRO 2014)

Vikas Garg & **Baldev Setia**
Title: "Scour Comparison around circular Pier, Oblong Pier and equivalent Pier group"
• vgarg@ddn.upes.ac.in

Sarbjit Singh & Zulfequar Ahmad
Title: "Vertical Mixing of Pollutants With Unsteady Transverse Line Source"
•sarbjit@thapar.edu • zulfifce@iitr.ernet.in

Jal Vigyan Puraskar

(Best paper in ISH Journal)

Mohammad Aamir & **Nayan Sharma**
Title: "Riverbank protection with Porcupine systems: development of rational design methodology"
published in ISH JHE, Vol. 21 (3) (2015)
• aamir.dce2014@iitr.ac.in

B.K. Gandhi, H.K. Verma & **Boby Abraham**
Title: "Mathematical Modelling and simulation of flow velocity profile for rectangular open channels"
published in ISH JHE, Vol. 23 (2) (2016)
• bkgmefme@iitr.ernet.in

Prof. U. C. Kothyari - ISH Best Ph D thesis award

Dr. Debasish Pal
Thesis title: "Mathematical Modeling on Non-Cohesive Sediment Transport in Open Channel Turbulent Flow".
• bestdebasish@gmail.com

Prof. U. C. Kothyari - ISH Best M Tech Thesis Award

J R Khuntia, NIT, Rourkela
Thesis title: "Effect of Secondary Current on Flow Prediction in an Open Channel Flow".
• jnanaranjan444@gmail.com

National Conference on 'Water Resources and Flood Management with special reference to Flood Modelling' (WRFM 2016)

The Centre of Excellence (CoE) on 'Water Resources and Flood Management', Department of Civil Engineering, Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat had organized a National Conference on "Water Resources and Flood Management with special reference to Flood Modelling" (WRFM 2016) under the aegis of Indian Society for Hydraulics (ISH) Pune, during October 14-15, 2016 at SVNIT. The financial support to the conference was provided from World bank assisted TEQIP-II project of Ministry of Human Resources Development (MHRD), Government of India. The announcement regarding the conference was made in the last week of May. The abstracts were invited from the interested students, research scholars, academicians, scientists and field engineers working in the area of hydraulics, hydrology and water resources management.

A total of 136 participants attended the conference from different backgrounds with 82 students (UG/PG & PhD), 37 Academicians and 17 Field Engineers from Central and State Government agencies. During the conference, 71 technical papers were presented in different technical sessions apart from 12 key note addresses. The theme wise details are as under:

- Hydrological Modelling and Management of Water Resources (WRH) – 40
- Morphodynamics of Alluvial Rivers (WRM) – 18
- Flood Modelling and Management (WRF) – 13

WRFM 2016 Inaugural address by the Chief Guest Shri M. Thennarasan, Municipal Commissioner, Surat Municipal Corporation

Group Photo WRFM 2016

Report on the International Seminar on

"RELIABLE DATA ACQUISITION SYSTEM FOR INTEGRATED WATER RESOURCES MANAGEMENT"

7-8 November 2016, Hotel Hyatt Regency, Pune.

1.0 Introduction:

The Ministry of Water Resources, River Development, and Ganga Rejuvenation (MoWR, RD&GR), with support from the World Bank, is undertaking National Hydrology Project (NHP) with the objective "to improve the extent, quality and accessibility of water resources information, and to strengthen the capacity of water resources management institutions in India."

The National Hydrology Project (NHP) has a Pan-India coverage and is being implemented with the objective to support the development of hydrometric networks, data management systems, Water Resources Information System, development of standardized methodologies and tools for water resources operations and planning procedures.

On the backdrop of this, CWPRS, Pune, in its Centenary Year 2016 has organized an International Seminar on "***Reliable Data Acquisition System for Integrated Water Resources Management***" during 7-8 November, 2016 at Hotel Hyatt Regency, Pune, in collaboration with Indian Society for Hydraulics and under the aegis of NHP. MoWR, RD & GR had kindly consented for organizing the seminar.

2.0 Objectives of the Seminar

The main objective of the Seminar was to bring together Water Resource Management practitioners and leading HydroMet Instrument Manufacturers of the world to discuss issues pertaining to Hydrological Data Acquisition for IWRM. Leading HydroMet manufacturers across the world showcased their instruments through presentations as well as exhibits. Invited experts from all over the world presented international best practices of IWRM through instruments. An Exhibition was also running in parallel, supporting the theme and showcasing the technologies, latest developments and solutions available. A copy of the Brochure of the Seminar is enclosed with this report.

3.0 Inauguration of Seminar

The Chief Guest Dr. Amarjit Singh during his inaugural address emphasized upon the need for effective usage of water which is already stressed and depleting alarmingly. He desired that in the coming six to seven years, all states should be covered under NHP and shall be strengthened with specialized water management systems. He congratulated CWPRS for providing such an excellent platform to kick start the NHP and desired for fruitful deliberations through this seminar.

The Chief Guest of the Inaugural Session also released a souvenir, a copy of which is enclosed with this report. The inaugural session concluded with vote of thanks by Dr (Mrs) V V Bhosekar, Scientist 'E', CWPRS. The exhibition was inaugurated by Dr Meike Van Ginneken, Practice Manager, World Bank.

Inaugural address by Dr. Amarjit Singh, OSD, MoWR, RD & GR

Dr. Z.S. Tarapore addressing the participants during valedictory function

National Conference on Water Resources & Hydropower (WRHP – 2016)

National Conference on Water Resources & Hydropower was held at University of Petroleum & Energy Studies, Dehradun in association with The Indian Society for Hydraulics (ISH) during June 17 – 18, 2016. The main objective of the conference was to disseminate the awareness about the management of water resources & optimal hydro-electric generation. Industry and academic experts from all over India had come together to network and discuss the advancements in different aspects of water resources & Hydro Power Engineering. The conference was held successfully with around 40 papers being published and about 100 participants. Dr Vikas garg was the Convenor. Several dignitaries like Prof.K.Subramanya, Prof.D.Nagesh Kumar from IISc Bangalore were also present on the occasion and delivered key note lectures.

Group photo of participants, during WHRP 2016

3rd National Conference on Sustainable Water Resources Development & Management (SWARDAM – 2016)

Third National Conference on Sustainable Water Resources Development & Management was organized by Department of Civil Engineering, Government college of Engineering, Aurangabad in association with The Indian Society for Hydraulics (ISH) - Aurangabad Local Centre and Indian Water Resources Society (IWRS) during 4 – 5 July, 2016. The themes of the conference covered various important aspects like River basin management, Irrigation planning and management, Impact of climate change on water resources planning, Modeling and soft computing etc,. Industry and academic experts from all over India had come together to discuss the advancements in different aspects of water resources development & Management. The conference was held very successfully with around 50 papers being presented. The conference proceedings was also published during the inaugural session. Around 100 participants were present during the conference. Prof.K.A.Patil was the convenor and Dr D.G.Regulwar was the Organising Secretary.

Prof. M. C. Deo addressing the participants during SWARDAM 2016

HYDRO POWER DEVELOPMENT - SOME PROBLEMS & REMEDIAL MEASURES

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Abstract

India has a hydro–power potential of 90,000 MW at 60% load factor corresponding to a potential installed capacity of 1,50,000 MW. Currently hydro-power share is about 17 % against an ideal share 40% in a hydro-thermal mix of power supply. Out of 1,45,320 MW of major hydro-potential of India, 94, 900 MW i.e. 65.3% is yet to be developed in the country. State of Arunachal Pradesh with a major potential of about 50,000 MW has developed only 5-6% of hydro-power so far and a large numbers of projects are in the pipeline in Arunachal, Himachal and Uttarakhand. Execution of hydro-electric projects in India is being increasingly difficult mainly due to objections raised by several groups of environmental lobby. The paper addresses some of the problems in execution and remedial measures adopted by the developers.

Key Words: Hydro-power, run-off the river plants, problems of execution, remedial measures

1. INTRODUCTION

Hydro-power is a clean and renewable source of energy. Unlike thermal power, it does not pollute air. Properly planned and executed, hydro-power has long life with very little maintenance cost. Unit cost of hydro-electric power is the lowest. The greatest advantage of hydro-power is its flexibility of operation. It is for this reason, hydro-power is generally assigned peak part of load whereas base load is assigned to thermal power in hydro-thermal mix of power supply. Ideal mix of thermal and hydro-power in a power system is about 60:40. The current mix of about 83:17 indicates that India badly needs more of hydro power for economy and stability of power grid supplying power all over the country. There are countries like Norway where 100% power is supplied by hydro.

The Himalayan region is attractive for hydro-power generation because all the rivers in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh descend from around 3,500 m to 500 m in a short distance of 200-km stretch. This water wealth and terrain head are nature's gift and a bounty for the relatively underdeveloped states and for the country as a whole. Our country has planned a large numbers of hydro-power projects, especially in the north east where hydro-power potential is in abundance but development is extremely poor. This is not to say that abstraction of fresh water by blocking of rivers for power generation is being indiscriminately allowed disregarding either the geotechnical/seismic safety of the terrain or the riparian need of the river to support the needs of humans as well as terrestrial and aquatic ecosystem down the river. Apart from hydro-power, the project proponents offer drinking water, recreation, tourism, infrastructures, education, employment opportunities of poor people living in hilly areas in India. Execution of the hydro projects is becoming increasingly difficult because of several problems. One of the objectives of this paper is to highlight some of these problems and discuss remedial measures for early execution of hydro- power projects in our country.

2. HYDRO-POWER DEVELOPMENT IN INDIA

Canada, USA, Brazil and China have developed 210 GW, 84 GW, 79 GW and 74 GW hydropower respectively, compared to only 38 GW by India as on 30.4.2013.Table-1 gives the hydro-power potential with 60% load factor and hydro-energy potential in some of the countries in the world including India. The hydro-power potential of India has been estimated as 90,000 MW at 60% load factor equivalent to about 1,50,000 MW installed capacity. Total hydro-power potential of India including pump storage, tidal, river linking, mini and micro hydel schemes is about 3,00,000 MW (Mishra, 2013). 60% of India's hydro-power potential lies in Arunachal, Himachal and Uttarakhand states. Table-2 shows the installed capacity of different river basins in India (Madan,2013).

Table-1 Hydro power Potential in some of the Countries in the World (Source: Google)

	Canada	USA	Russia	Brazil	Japan	France	Norway	China	India
Hydro Power Potential at 60% Load Factor (10^3 MW)	341	319	160	286	85	78	122	204	90
Hydro Energy (10^6 KW-h)	67	80	44	58	28	78	78	65	23

Table-2 Hydro-Power potential in different River Basins in India(Source:Google)

River Basins	Installed Capacity(MW)
Indus Basin	33,832
Ganga Basin	20,711
Central Indian River system	4,152
Western Flowing Rivers of southern India	9,430
Eastern Flowing Rivers of southern India	14,511
Brahmaputra Basin	66,065
Total	1,48,701

State wise distribution of hydro-power potential of India and the status of development as on 29.2.16 is given in table-3. Out of a total of 2,23,626 MW Installed capacity of India (including thermal, hydro, nuclear and wind), the share of major hydro-power in operation is 37,917 MW i.e. 17 % only against an ideal share of about 40%. Out of 1,45,320 MW of major hydro-potential of India, 94, 900 MW i.e. 65.3% is yet to be developed in the country. Against 197 feasible projects with the potential of 21,212 MW (including major,small and mini/micro) in Ganga and Yamuna basins (table-4), only 38 projects are completed so far with a capacity of about 4,500 MW only.

Table-3 State Wise Major Installed Capacity (above 25 MW) in India as on 29.2.16 (Source: www.cea.nic.in)

Region/State	Identified Capacity as per reassessment study		Capacity Under Operation		Capacity Under Construction		Capacity Under Operation +		Capacity yet to be developed	
	Total (MW)	Above 25 MW	(MW)	%	(MW)	(%)	(MW)	(%)	(MW)	%
NORTHERN										
Jammu & Kashmir	14,146	13,543	31,19.0	23.03	1,180.0	8.71	4,299.0	31.74	9,244.0	68.26
Himachal Pradesh	18,820	18,540	9,308.0	50.20	2,216.0	11.95	11,524.0	62.16	7,016.0	37.84
Punjab	971	971	1,206.3	100	206.0	21.22	1,412.3	100.00	0.0	0.00
Haryana#	64	64	0.0	0	0.0	0.00	0.0	0.00	0.0	0.00
Rajasthan##	496	483	411.0	85.09	0.0	0.00	411.0	100.00	0.0	0.00
Uttarakhand	18,175	17,998	3,756.4	20.87	1,430.0	7.95	5,186.4	28.82	12,811.7	71.18
Uttar Pradesh*	723	664	501.6	75.54	0.0	0.00	501.6	75.54	39.0	5.87
Sub Total (NR)	53,395	52,263	18,302.3	35.02	5,032.0	9.63	23,334.3	44.65	28,928.8	55.35
WESTERN										
Madhya Pradesh	2,243	1,970	2,395.0	100	400.0	20.30	2,795.0	100.00	0.0	0.00

Region/State	Identified Capacity Capacity as per reassessment study		Capacity Under Operation		Capacity Under Construction		Capacity Under Operation +		yet to be developed	
	Total (MW)	Above 25 MW	(MW)	%	(MW)	(%)	(MW)	(%)	(MW)	%
Chhattisgarh	2,242	2,202	120.0	5.45	0.0	0.00	120.0	5.45	2,082.0	94.55
Gujarat	619	590	550.0	100	0.0	0.00	550.0	100.00	0.0	0.00
Maharashtra	3,769	3,314	2,487.0	75.05	0.0	0.00	2,487.0	75.05	827.0	24.95
Goa	55	55	0.0	0.00	0.0	0.00	0.0	0.00	55.0	100.00
Sub total (WR)	8,928	8,131	5,552.0	68.28	400.0	4.92	5,952.0	73.20	2,179.0	26.80
SOUTHERN										
Andhra Pradesh	2,366	2,341	1,746.8	74.62	1,010.0	43.14	2,756.8	117.76	0.0	0.00
Telangana	2,058	2,019	551.0	27.29	240.0	11.89	791.0	39.18	1,228.0	60.82
Karnataka	6,602	6,459	3,585.4	55.51	0.0	0.00	3,585.4	55.51	2,873.6	44.49
Kerala	3,514	3,378	1,881.5	55.70	100.0	2.96	1,981.5	58.66	1,396.5	41.34
Tamilnadu	1,918	1,693	1,782.2	100	0.0	0.00	1,782.2	100.00	0.0	0.00
Sub Total (SR)	16,458	15,890	9,546.9	60.08	1,350.0	8.50	1,0896.9	68.58	4,993.2	31.42
EASTERN										
Jharkhand	753	582	170.0	29.21	0.0	0.00	170.0	29.21	412.0	70.79
Bihar	70	40	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
Odisha	2,999	2,981	2,027.5	68.01	0.0	0.00	2,027.5	68.01	953.5	31.99
West Bengal	2,841	2,829	312.2	11.04	240.0	8.48	552.2	19.52	2,276.8	80.48
Sikkim	4,286	4,248	765.0	18.01	2,526.0	59.46	3,291.0	77.47	957.0	22.53
Sub Total (ER)	10,949	10,680	3,274.7	30.66	2,766.0	25.90	6,040.7	56.56	4,639.3	43.44
NORTH EASTERN										
Meghalaya	2,394	2,298	282.0	12.27	40.0	1.74	322.0	14.01	1,976.0	85.99
Tripura	15	0	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
Manipur	1,784	1,761	105.0	5.96	0.0	0.00	105.0	5.96	1,656.0	94.04
Assam	680	650	375.0	57.69	0.0	0.00	375.0	57.69	275.0	42.31
Nagaland	1,574	1,452	75.0	5.17	0.0	0.00	75.0	5.17	1,377.0	94.83
Arunachal Pradesh	50,328	50,064	405.0	0.81	2,854.0	5.70	3,259.0	6.51	46,805.0	93.49
Mizoram	2,196	2,131	0.0	0.00	60.0	2.82	60.0	2.82	2,071.0	97.18
Sub Total (NER)	58,971	58,356	1,242.0	2.13	2,954.0	5.06	4,196.0	7.19	54,160.0	92.81
ALL INDIA	**1,48,701**	**1,45,320**	**37,917.8**	**26.09**	**12,502.0**	**8.60**	**50,419.8**	**34.70**	**94,900.2**	**65.30**

The present status of hydro development in Alakananda and Bhagirathi basins is that only four major projects - Tehri, Maneri-Bhali-I & II and Vishnuprayag of 3,164 MW capacity have been commissioned. Another five projects are in different stages of implementation. State of Arunachal Pradesh with a major potential of about 50,000 MW has so far developed only 5-6% of hydro-power so far and a large numbers of projects are in the pipeline.

TABLE-4: Distribution of Total Hydro-Power Potential (MW) In Ganga &Yamuna Basin

Basin	Large Hydro projects (above 25 MW)		Small Hydro projects (1-25 MW)		Mini-micro Hydro projects (below 1 MW)		Total Hydro projects	
	No of projects	Capacity	No of projects	Capacity	No of projects	Capacity	No of projects	Capacity
Alaknanda	29	4823	43	375.6	2	0.65	74	5199.25
Bhagirathi	5	675	13	125.5	4	1.4	22	801.9
Ramganga	6	314	12	93.5	2	1	20	408.5
Sharda	26	11920	16	101.95	6	0.33	48	12022.28
Yamuna	17	2670	13	110.3	3	0.55	33	2780.85
TOTAL	83	20402	97	806.85	17	3.93	197	21212.78

3. PROBLEMS & REMEDIAL MEASURES

Execution of hydro-electric projects in India is being increasingly difficult mainly due to objections raised by several groups of environmental lobby. There is stiff opposition from this group citing several consequences e.g. submergence of land, rehabilitation of affected people, loss of fish and other aquatic life, loss of natural eco-systems, drying of river, silting of reservoirs etc. Some of the problems and remedial measures adopted by developers are discussed in the following paragraphs.

3.1 Submergance of Land and Forest

In major multipurpose projects e.g. Bhakra, Tehri etc. where a reservoir is built with the objective of storing water for irrigation, hydro-power generation, flood control etc. , a vast area of agricultural and forest land gets submerged. Such hydro-power development is almost impossible now a days because of resistance from people dependent on land and forests.

Run-off the river type developments (Fig.1) with limited storage is now a days popular since it creates little storage as the flow is diverted through tunnels to utilize the terrain head for hydro-power generation. Natha - Zhakri and similar other run-off the river type projects with remote installations are being planned to generate hydro-power by diverting dependable flow through long distance tunnels. (Fig.2) Usually, 90% dependable year flow is considered for determining installed capacity by incremental energy method.

3.2 Siltation of Reservoirs

A major problem being faced is the fast depletion of storage capacity due to siltation of reservoirs. Many of the reservoirs built in fifties and sixties are going to be obsolete (Koomullil et.al2015, Mazumder,2016) as their dead storage capacities are full of sediments and their useful life is limited due to fast depletion of their live storage space. In the earlier designs, it was presumed that all the incoming sediments would be deposited only in the designated dead storage space and the useful life of projects will be the design life. However, sediment deposition and distribution of sediments within the reservoir space is dependent on terrain condition, shape of reservoir and other factors (CBIP,1980). In the initial stage of planning, all these factors were not considered.

In the current planning and design of diversion type development, where a barrage is constructed across the river, the height of solid obstruction is kept very small. They are provided with sluice gates and breast walls (Fig3) to create required head for flow diversion in to the head race tunnels. These gates are fully raised during the flood season to wash out the sediments deposited within the reservoir. Since run-off the river schemes are designed for 90% dependable flow only, large volume of water is available for flushing in the monsoon season. It is customary to eliminate sediments of size more than 2mm or so (depending on the head at which turbines operate) by providing desilting chambers within the tunnel. These desilting chambers are periodically flushed out by diverting flow in to the river downstream of barrage.

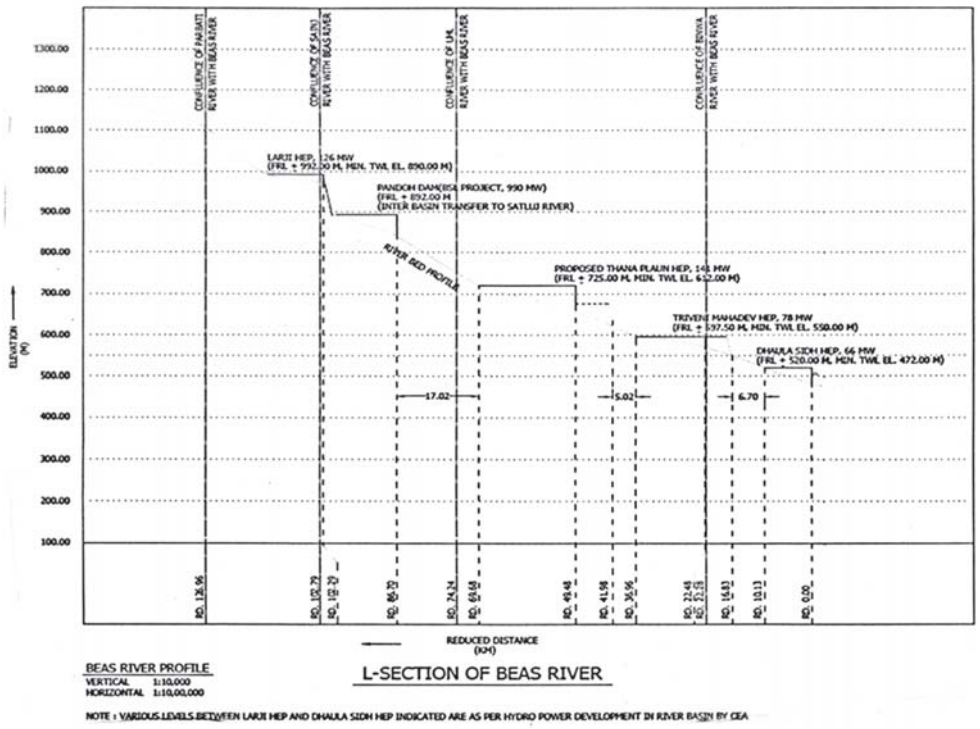

Fig.1 Run-off the River Type Development in River Beas (Source:HPCCL,2011)

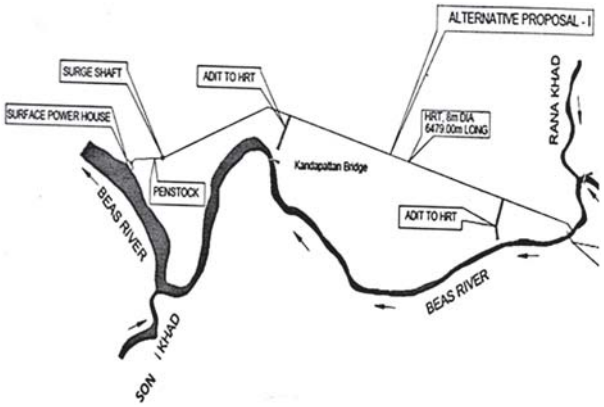

Fig.2 Remote Type Hydro-Electric Installation with Diversion Tunnels in River Beas (Source:HPCCL,2011)

All developers have a tendency to use as much water as possible for generation of power for commercial uses even during the monsoon season. It should be regulated such that water needed for flushing out sediments at intervals are not diverted for power generation. Plant capacities are to be fixed accordingly. Dam toe power house of limited capacity may be permitted.

3.3 Tunneling

In all remote type installations, long tunnels (Fig.2) are to be excavated through the side hills connecting the power house with the power intake. Length of such tunnels is governed by the terrain head to be utilized for hydro-power generation. The terrain head in the tailrace is also used in reaction type turbines e.g. Francis and Kaplan types. Construction of the head race and tail race tunnels by blasting techniques cause not only disturbances to the people living nearby, it may actuate landslides too. The problem is overcome by introducing tunnel boring machines. Tunneling speed is substantially increased by introducing such machines.

Tunnels interfere with ground water flow often resulting in drying up of springs and lowering of ground water table. Local people, depending on ground water, often complain about non-availability of water for drinking and other domestic purposes. Water supply by gravity from ponds at higher elevation through pipe systems is provided at extra cost incurred by the developers. However, maintenance and overhead costs can be borne by people if they are assured of firm piped water supply. Prior to hydro-power development, people used to walk daily down and up the slope which is an arduous task causing lungs and other respiratory deseases.

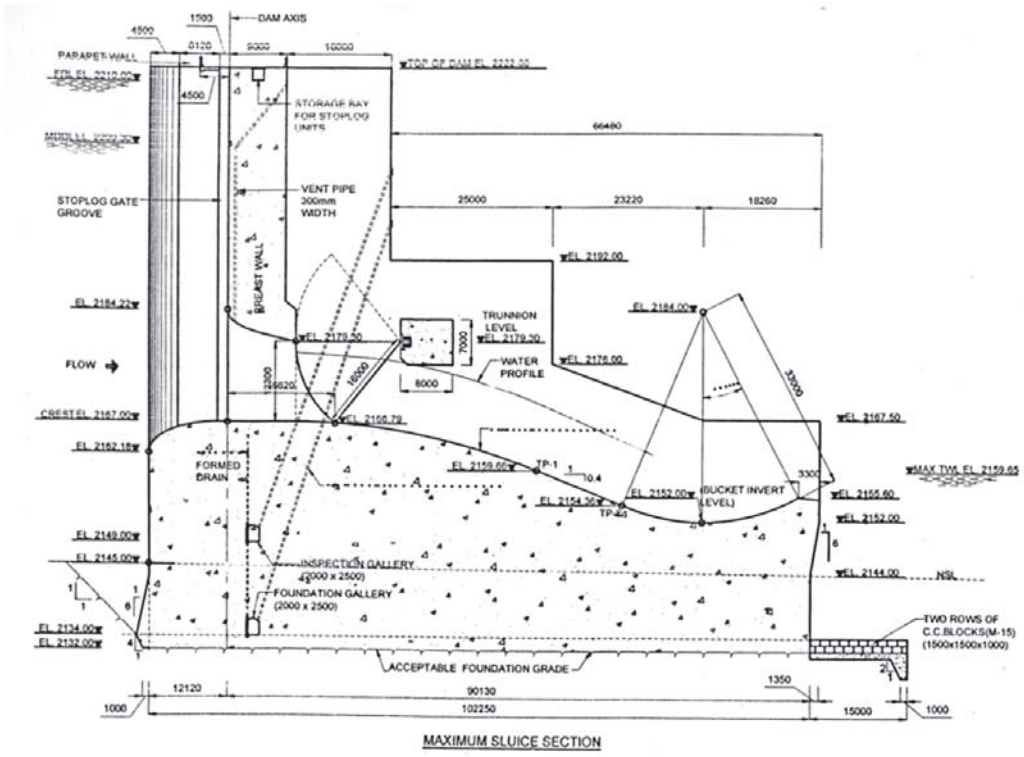

Fig.3 Showing Low height Dam, Breast Wall and Radial Sluice Gates for Flushing (Source:L&T Himachal Hydro-Power Ltd.)

3.4 Land Slides

Most of the hydro-power projects are located in mountainous and hilly regions where the terrain is steeply sloping. Often there are landslides due to earthquakes, avalanches and other natural phenomena like high rainfall and run-off. Thorough geological study of such slide prone areas are now-a-days compulsorily carried out for deciding location of barrage, power house, tunnels, residential areas and to avoid geological surprises. Use of software like Geo-slope is a very tool for finding stability of hill slopes. Slides can be prevented by rock bolting, geo-textile netting and construction of gabion walls etc.

Mucks generated from tunneling and other construction works are carefully placed at selected sites with terracing and properly designed retaining walls. A minimum of 50m distance should be kept in between the flood line and first retaining wall so that the mucks do not join the river during rainy season.

3.5 Loss of Aquatic Life

All hydro-power projects are responsible for loss in aquatic life like fishes and other aquatic life mainly due to drying of the river in the stretch between barrage and power house. It is for this reason; Govt. of India has enacted to compulsorily ensure a minimum environmental flow usually 20 to 30percent of the lean season flow. Developers have a tendency to use as much dry weather flow as possible for generation purpose. It is very important to monitor that the minimum dry weather flow is admitted to the river from the reservoir either by regulating sluices or by installing dam toe type power house making use of the environmental flow for power generation .

3.6 Loss of Eco-Systems

Environmentalists have serious objection to building hydro-power projects citing loss of eco -system, destruction of animal and plant life, especially those of endangers species. Their views should be respected and all necessary measures are adopted to protect eco-systems. Fish passes of improved design are inbuilt. Minimum dry weather flow ensures aquatic life and natural scenario a river offer to tourist\s and pilgrims. Elaborate environmental impact study is carried out to delineate endangered species and their protection measures. For every tree cut, new plants are sown, birds and animal sanctuaries are protected, and environmental flow released. The habitations and muck disposal areas are properly planned maintaining the natural landscape congenial to the region. All these provisions are inbuilt in the project planning and cost estimtes.

3.7 High Capital Costs

Hydro-Power development needs high capital costs because of long gestation period, acquiring land, rehabilitating affected persons and so on. Developers are required to build roads for communication, buildings for rehabilitation, social improvement by building schools, healthcare facilities, training of local people engaged in the project etc. Although not directly related to projects, such social activities need a lot of money and time. Without these activities, developers face a lot of resistance from local people often misguided by persons opposed to such development and more often by opposition political parties for their vested interest. Project authorities have to convince such people about the utility of the project by convening meetings and publicizing the developmental activities.

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NEWLY JOINED ISH MEMBERS DURING JULY 2016 to JUNE 2017

Mem No.	Name	Mem No.	Name	Mem No.	Name
1208	Dr. K. Padma Kumari	1230	Ms Ashwini A. Purekar	1253	Mr. V Rama Raju
1209	Shri Kuldip Biharilal Patel	1231	Shri Phulpagar Sanju 1232	1254	Mr. Bikas Chaudhari
1210	Ms Aparna Shivsharanappa	1233	Prof. Dr. Shaik Rehana	1255	Mr. Padam Jee Omar
1211	Shri Himanshu Gupta	1234	Mr. B. Suresh Kumar	1256	Mr. Prabhat Kumar Singh
1212	Ms Apurva Maruti Kudale	1235	Mr. Inayatali L Shah	1257	Mr. Prajapati Keyur
1213	Shri Hastimal Shivaji	1236	Mr. Pasupuleti Laxmi	1258	Mr. Abhay
1214	Shri Pushpak D. Dabhade	1237	Ms. Meenal.K.Dave	1259	Mr. Kumar Shashwat
1215	Ms Priyanka Kakasaheb	1238	Mr. Anant.D.Patel	1260	Mr. R Maheswaran
1216	Mr. Sharma Sumit Nandlal	1239	Ms. Maya Mahesh	1261	Mr. Vikas M
1217	Shri Rahul Agrawal	1240	Ms. Shweta Anil Narkhede	1262	Ms. Bhavana Ajudiya
1218	Ms Prachi Surykant Dhage	1241	Ms. Madhuri S Bhagat	1263	Gandhare Kishor U
1219	Mohammed Aamir Javeed	1242	Mr. Arvind Devidas Siddral	1264	Mr. Narwade Raju
1220	Shaikh Saba Anjoom	1243	Mr. Ravi Prakash Tripathi	1265	Mr. Karthik Nagarajan
1221	Ms Diksha Diliprao	1244	Dr. Deepak Swami	1266	Vidyanand G Sayagavi
1222	Ms Priyanka Misal	1245	Mr. Ranjeet Satish Sabale	1267	Mr. Ruben Nerella
1223	Ms Pallavi Kulkarni	1246	Mr. Mrunmay Junagade	1268	Mr. R Shreedhar
1224	Shri Rushikesh Mahendra	1247	Mr. Aditya Surana	1269	Dr. Celine George
1225	Ms Sonali V. Potdar	1248	Mr. Parag Arun Kashyape	1270	Dr. Resmi T R
1226	Shri Abhijeet P. Keskar	1249	Mr. Anil Kumar	1271	Ms. Drissia T K
1227	Shri Taji Satish Ganesh	1250	Dr.R Manivanan	1272	Ms. Shweta Rathi
1228	Ms Heena Yadavrao Ingale	1251	Ms. V Sahana	1273	Dr. N Saji Kumar
1229	Ms Priya Laxman Kashinde	1252	Ms. Neha Manoj	1274	Dr. G Venkatesan

INDIAN SOCIETY FOR HYDRAULICS

BUDGET FOR THE YEAR 2017-18

Income	₹	Expenses	₹
Membership Fee		Payment for online Journal/Special	
Life Member & Fellow Member	1,50,000	Issue & Printing charges for Bulletin	3,50,000
Contribution from		Postage	50,000
Corporate Members	30,000	Website charges	20,000
Bank Interest on Fixed Deposit	3,30,000	Stationery & Electronic Accessories	40,000
HYDRO 2016 Workshops		Audit & A/c. writing charges	10,000
& Seminars	3,50,000	Secretarial Assistance charges	40,000
Grant-in-Aid (INCH – AICTE/DST)	1,40,000	Assistance for IAHR Participation	30,000
		Prizes & Trophies & S N Gupta	
		Memorial Lectures	1,00,000
		Workshops /Seminars etc.	50,000
		Miscellaneous including Transport	
		Expenses for meeting etc.	1,00,000
		Provision for Income Tax	25,000
			8,15,000
		Balance over year	**1,85,000**
	10,00,000		**10,00,000**

THE INDIAN SOCIETY FOR HYDRAULICS

(FIXED DEPOSIT AND SAVING BANK BALANCE STATEMENT)

AS ON 31-JAN-2017

1	Canara Bank(S.B A/c No. 25801010000822)	₹	683356
2	State Bank of India (S.B. A/c No. 30633921394)	₹	92114
	Total in Saving Bank Accounts	₹	**775470**

Sr. No.	Name of Bank	Date of Deposit	Date of Maturity	Amount ₹	Rate of Interest
1	Canara Bank, Khadakwasla,	02-Jan-14	27-Sep-16	192184	9.05%
	P.O. R.S., Pune - 411024	26-Aug-15	26-Aug-18	800000	8.00%
	(6 FDs)	07-Mar-12	07-Mar-17	200000	9.25%
		07-Mar-12	07-Mar-17	150000	9.25%
		09-May-16	08-May-19	1154490	7.55%
		02-Jul-16	02-Jul-19	640523	7.55%
	Total FD amount with Canara Bank			₹ **3137197**	
2	State Bank of India,	28-Jun-16	28-Jun-17	518128	7.00%
	DIAT, Girinagar, Pune-411025	08-May-16	08-May-19	126580	7.00%
	(2 FDs)				
	Total FD amount with State Bank			₹ **644708**	
	Total FD amount			₹ **3781905**	
	Grand Total			₹ **4557375**	

(Rupees Forty five lakh fifty seven thousand three hundred & seventy five only)

SCHEDULE VIII
[VIDE RULE 17(1)]

REGISTRATION NO. : F-755 (PUNE)

NAME OF THE PUBLIC TRUST : THE INDIAN SOCIETY FOR HYDRAULICS

BALANCE SHEET AS AT 31ST MARCH 2016

FUNDS & LIABILITIES	SCH. NO.	Rs.	PROPERTY AND ASSETS	SCH. NO.	Rs.
Trust Fund or Corpus: Balance as per Last Balance Sheet		1504132.00	Movable properties	4	1847.60
Life Membership Fees received during the year		184900.00	Immovable properties		0.00
Add: Corpus Donations		0.00			
		1689032.00	Investments	5	3196616.00
Other Earmarked Funds: (Created under the provision of the trust, deed or scheme or out of the Income)	1	549500.00	Advances To Employees		0.00
			To others		0.00
			Deposits		0.00
Loans	2	5340.00			
Liabilities For Expenses		0.00	Cash and Bank Balances:	6	346999.32
			Sundry Debtors		0.00
For Duties & Taxes		0.00			
Sundry Creditors		0.00	Income Outstandings:	7	843067.70
Branch/Divisions		0.00			
Income and Expenditure Account:	3	2142238.62			
TOTAL		4386110.62	TOTAL		4386110.62

The Above Balance Sheet To The Best Of Our Belief Contains A True Accounts Of Funds And Liabilities And Of The Property And Assets Of The Trust

AS PER OUR REPORT OF EVEN DATE.

For The Indian Society For Hydraulics

(Trustees) (Trustees) (Trustees) (Accountant)

For S.G.Sahasrabudhe & Associates
Chartered Accountants

(CA.S.G.Sahasrabudhe)
(Partner)
M.No.35205

Date :
Place : PUNE

SCHEDULE VIII
[VIDE RULE 17(1)]

REGISTRATION NO. : F-7555 (PUNE)

NAME OF THE PUBLIC TRUST : THE INDIAN SOCIETY FOR HYDRAULICS

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH 2016

EXPENDITUE	SCH. NO.	AMOUNT Rs.	INCOME	SCH. NO.	AMOUNT Rs.
To Depreciation	4	2771.00	By Interest Income	8	370324.35
To Establishment expenses	9	125656.00	By Income from other sources (in details as far as possible)		
To Expenditure on objects of the trust - Educational	10	577600.00	By Institutional Membership IAHR		54889.00
To Repairs & maintenance		5977.00			
To Professional Fees	11	14200.00			
To Legal expenses		0.00			
To IAHR Membership		26566.00			
To Surplus carried over to Balance Sheet		-325576.65			
TOTAL		425213.35	TOTAL		425213.35

AS PER OUR REPORT OF EVEN DATE.

For The Indian Society For Hydraulics

(Trustees) (Trustees) (Trustees) (Accountant)

For S.G.Sahasrabudhe & Associates
Chartered Accountants

(CA.S.G.Sahasrabudhe)
(Partner)
M.No.35205

Date :
Place : PUNE

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P. O. Central Water & Power Research Station,
Khadakwasla, Pune - 411 024. INDIA.

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